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ABSTRACT

This study used an eclectic, qualitative research design to explore the effects of visual and verbal variables on affective response and cognitive learning in four different groups of students. The four design imperatives of the study were: (1) both of the primary learning senses (sight and hearing) had to be included in the study; (2) the inquiry was to be extended into both the affective and cognitive domains; (3) the final design had to have holistic integrity; and (4) every effort had to be made to prevent this study from turning into another "Medium A versus Medium B" study. The sight and hearing continua used in the design of four different slide-tape presentations were modified from the Wileman Typology and employed to treat the range of various kinds of visual and auditory images involved in instruction as a single variable. Data on cognitive achievement were collected through the use of a pretest, a posttest, and a post posttest designed for this study and subjected to statistical analysis using commercial software. Findings showed that significant differences existed among the four treatment groups in the degree of cognitive achievement, and that there were also significant differences among the groups in the degree of affective response. (12 references) (CGD)

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An Eclectic Qualitative-Quantitative Research Design for the Study of Affective-Cognitive Learning

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An Eclectic Qualitative-Quantitative Research Design for the Study of Affective-Cognitive Learning

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Whenever a research question or set of questions calls for investigation of complex phenomena there is the distinct possibility that no single research technique will provide a clear answer or set of answers. Experimental research designs generally call for the isolation of discrete variables and proceed from there through appropriate data collection and manipulation routines leading to results upon which we can place a high level of confidence. Usually when we wish to explore the interactive relationships of two variables we simply stabilize one variable and manipulate the amount of variation of the other -- all the while observing the results. When we begin to operate in three or more variables, however, that simplistic dependent variable vs independent variable approach breaks down. In effect, for three variables we have at least two and possibly three dependent vs. independent comparisons. For four or more variables, the number of potential two-variable comparisons increases geometrically as the number of total variables increases (the sequence is 1, 3, 6, 10, 15, 21, 28, etc.). And each additional two-variable comparison that is to be investigated warrants consideration for unique experimental and/or data collection treatment. Of course none of this is new to research scholars, but the impact of running what amounts to several concurrent, but procedurally different experiments tends to mitigate against examination of multi-variable questions unless similar and compatible procedures are contemplated.

Occasionally, though, more than two dissimilar variables cry out to be investigated together. This paper describes a research design for considering the effects of visual and verbal variables on both affective response and cognitive achievement. The dissimilarities in techniques for measuring affective response and cognitive achievement necessitated the creation of an eclectic design.

Eclectic Design

Quantitative studies dominate the methodology of educational technology research. Robinson and Ong (1988) reviewed the methods employed by the authors of research journal articles from ECTJ and JID, published during the decade 1976-86, and found that only 65 of 216 studies (30%) utilized methods

other than experimental or survey. Experimental methods alone accounted for 57% of all studies. Altogether, quantitative methods were used for about three out of every four studies. Still, a fourth of all studies strayed from hard line quantitative approaches, and that percentage may be growing. A dozen or more alternative methods have appeared that each have their advocates. Importantly, in the smorgasbord of now-acceptable research techniques we find approaches for the study of qualitative questions.

Like the study at hand, many - maybe most - qualitative studies also have a natural quantitative component. In a simple example, even those things that must be measured according to their value (quality) can also be counted (quantified). Even with naturalistic inquiry, which presumes that the investigator collect data without a priori assumptions, there is no theoretical exclusion of **numerical** data in the collection effort. Consequently the naturalistic study may very well rely upon statistical techniques for the ultimate analysis of some or all of the information collected. Furthermore, there is nothing to infer that the naturalistic researcher will not automatically add even an experimental episode when the evolving structure of a study points to the need for quantitative analysis to fulfill the needs of the broader inquiry. Indeed, the researcher's option to combine elements from the various classic research designs may drive the research design processes of the future.

None of this is to suggest that the authors are herein espousing circumvention of sound procedures and abandonment of reason-based good practice. To the contrary. The clear implication is that good practice demands that research designs be like good food recipes. We must call for every ingredient that is needed. Thus as the skillful cook combines the recipe for crust with the recipe for pie filling, the skillful researcher can combine the design elements for a qualitative study that is the pie shell into which s/he pours the results obtained from an investigation based upon a quantitative design. These authors believe that they have cooked up such a dish (as have many, many other researchers before them). Rather than call the design a recipe, however, the authors have chosen to refer to the interleaving of functionally different design elements as eclectic. Eclecticism has clear advantages -- it allows one to borrow the best ideas and leave out the worst, and it is bereft of any baggage that requires the practicing eclectic to be the advocate of any one of the competing philosophies. The authors are not spokespersons for the experimental method which was used extensively in the study reported here; nor are they spokespersons for quasi-experimental, quasi-naturalistic or naturalistic methods which also played a part in the study.

Design Imperatives

When the authors sat down to discuss this study two years ago, the objective seemed clear and simple. There was a monumental hole in society's knowledge base concerning the bridge between affective response and cognitive learning. The authors had collaborated on an article (Braden and Beauchamp, 1987) which had toyed with some theory about display of information along a visual-verbal continuum -- a heuristic piece inspired by Wileman's Typology (1980). An obvious limitation of the Wileman continuum was that it applied only to messages conveyed visually. Also, even the end of the spectrum that was represented by totally pictorial visual material had been studied primarily for its utility in delivering cognitive concepts. From a sensory standpoint, the earlier work had been unidimensional, dealing only with the sense of sight. Intellectually the earlier work had been unidimensional, dealing only with knowing (cognition) and paying scant attention to appreciation, emotion and feeling (affect).

The first design imperative for this study was that both of the primary learning senses (sight and hearing) be included. The second imperative was to extend the inquiry into both the the affective and cognitive domains. The third design imperative was that the final design must have holistic integrity. In that sense, complexity could not be allowed to obscure the value of individual research procedures, nor could the detail of any technique command so much attention as to overwhelm the project as a whole. In other words, everything had to complement everything else.

The fourth design imperative was that every effort would be made to prevent this study from turning into another "Medium A vs Medium B" study. The very idea that instructional delivery systems such as slide + tape programs increase learning is one not widely accepted by all authors (Clark, 1987; Simonson & Burch, 1975; Simonson, 1987). Perhaps Clark overstated the case when he said that media were "mere vehicles that deliver instruction" and insisted that "they do not influence student achievement any more than the truck that delivers groceries causes changes in nutrition" (1983. p. 445). Overstated or not, he got everybody's attention. These authors wished not to compare vehicles (slide + tapes), but rather the way that the cargo (content) was packaged (the design formats). That moved this study into the arena of media attribute research with which Clark (1987, p.10) also has misgivings. But, the historical inadequacy of **cognitive** research on media attributes seemed, if anything, to be one more compelling reason to pursue this cognitive/affective study.

Attending to the second of these imperatives was the most troublesome because there are not yet any traditions or standards for performing research in the affective domain. Much confusion and ambiguity surround the affective domain. Martin and Briggs (1986) wrote an oversized book on the integration of the cognitive and affective domains. Yet they too were forced to be imprecise (or to use their term, "unfocused") about the definition of the affective domain and related concepts:

> The affective domain poses a unique set of problems for educators. First the definition of the domain and the concepts that comprise it are so broad and often unfocused that all aspects of behavior not clearly cognitive or psychomotor are lumped together in a category called the affective domain. For example, all of the following terms can be found associated with affect: self-concept, motivation, interests, attitudes, beliefs, values, self-esteem, morality, ego development, feelings, needs achievement, locus of control, curiosity, independence, mental health, personal growth, group dynamics, mental imagery, and personality (p.12).

Ringness (1975) defined the affective domain and used another set of terms -- emotions, interests, preferences, tastes, attitudes, values, morals, character, and personality adjustment -- as important parts of the domain. Martin and Briggs (1986), like Gephart and Ingle (1976), identify affective behaviors as having both an emotional tone and a cognitive component. Neither set of authors has suggested a sure fire way to separate the two components or even to identify where one leaves off and the other begins. Isolating anything to do with the affective domain is, to use the vernacular, like attempting to nail jello to the wall.

The Sight and Hearing Continua

The Wileman Typology basically established a sight continuum with all words at one end and no words at the other that interleaved with a concurrent continuum that progressed from no pictorial content to totally pictorial. The operational terms which the current authors have used previously to deal with this reciprocal pair of variables are "verbal-visual" (Braden & Beauchamp, 1986).

In order to treat the range of various kinds of visual images used in instruction as a single variable it was neces-

sary to consider the typology as a single continuum, assume some cognitive message content, and re-name the poles of the continuum as "verbal" and "non-verbal." This was more a nomenclature change than anything else. Anytime a slide is shown, for example, **something** appears on the screen. Accordingly, the inverse relationship of word elements to pictorial elements means that in this typology **both** variables are present if either variable is represented.

For the sense of hearing the analog is also a pair of reciprocal variables, but here too the variables are inversely related and can be treated as a single continuum with the bipolar extremes labeled verbal and non-verbal.

Figure 1 shows graphically how these sight and hearing continua would apply to the visual and sound components of a slide+tape program. A confounding factor for this type of investigation is the lack of complete understanding about hemispheric specialization of the human brain. The so-called left brain / right brain dichotomy may have a high correlation to the visual and audible continua as shown in Figure 1. However, this study was not intended to be brain laterality research, and the authors reserve judgment on the implications of these results to the growing body of brain function literature.

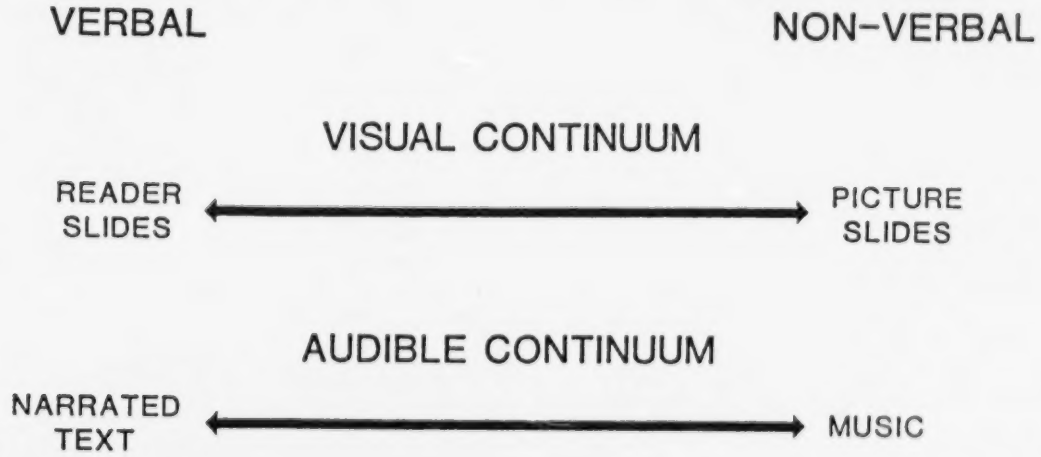

Figure 1. The visible and audible continua

METHODS

Four slide + tape presentations were constructed by the primary researcher (Beauchamp, 1988) to be shown to four different groups of students. A two-continua approach was employed, establishing a visual continuum and an audible con-

tinuum with "verbal" and "non-verbal" as the bipolar extremes on both continua. The design features of each of the four presentations are illustrated in Figure 2. They can be described as single screen, linear slide + tape presentations approximately 7 minutes 30 seconds in length consisting of the following elements: (Treatment A) picture slides as the "non-verbal" element of the "visual" continuum and narrated text as the "verbal" element of the "audible" continuum; (Treatment B) reader slides as the "verbal" element of the "visual" continuum and narrated text as the "verbal" element of the "audible" continuum; (Treatment C) reader slides as the "verbal" element of the "visual" continuum and music as the "non-verbal" element of the "audible" continuum; and (Treatment D) picture slides as the "non-verbal" element of the "visual" continuum and music as the "non-verbal" element of the "audible continuum. Data on cognitive achievement were collected through the use of a pretest, a posttest, and a post posttest designed for this study.

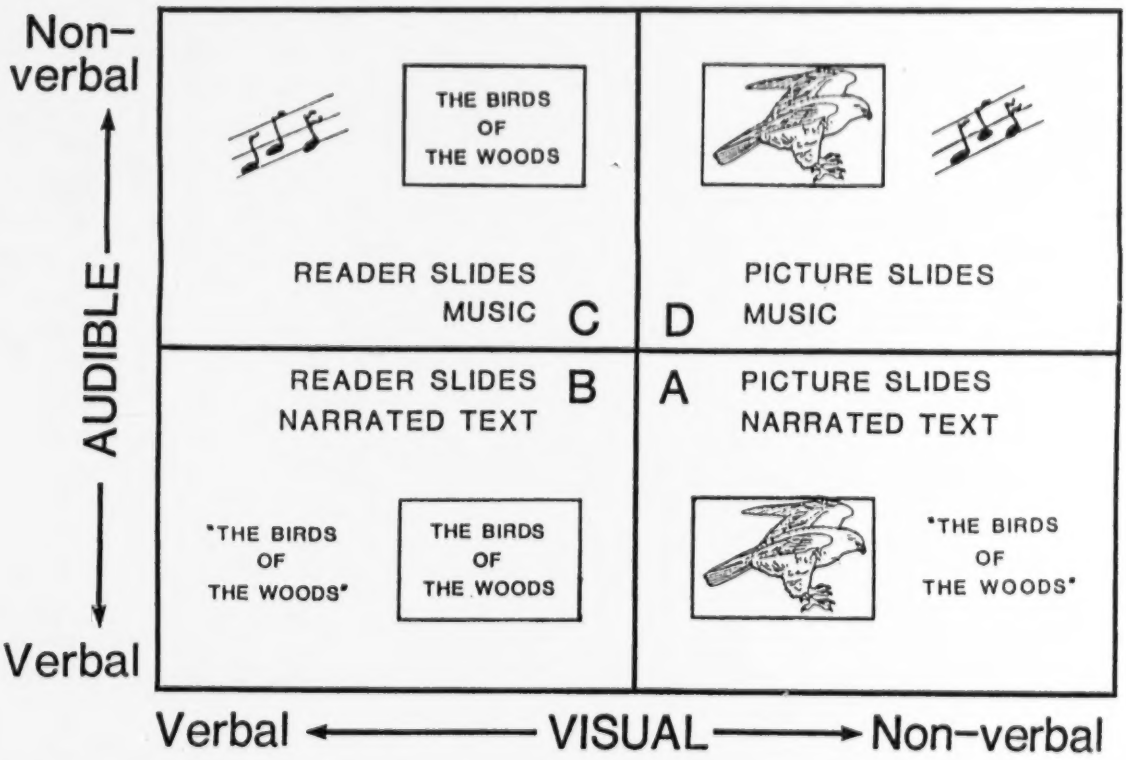

Figure 2. The slide + tape matrix

Affective reaction to the four treatments was measured as a function of attitudes toward the presentations themselves, i.e., the reaction toward "the show", and toward the

topic of the presentation. (In all cases the subject matter was about the relative barrenness of the oceans -- an esoteric topic previously unencountered by all subjects.) A semantic differential technique using two concept ideas and eleven bipolar adjectives for each concept, an attitudinal questionnaire using both Likert scale questions and techniques from the Semantic Differential, and two descriptive essay questions were employed to collect data in the affective domain.

A quasi-naturalistic "retelling" procedure was used to gain additional insight into the cognitive achievement of the four treatment groups. The retellings also produced attitudinal data not obtained by the attitudinal instruments, even though that was not the original purpose for employing the procedure.

Statistical data were compiled and computer analyzed through the use of a commercial statistical package. The procedures were traditional: analysis of covariance, one-way analysis of variance, Dunnett's Test for Critical Differences, and crosstabulations. The results of the statistical procedures are reported in detail elsewhere (Beauchamp, 1988).

Findings

The findings of this study showed that significant differences existed among the four treatment groups in the degree of cognitive achievement. The evidence was clear that the ways in which viewed material and heard material are combined make a difference in learner achievement. Earlier findings suggesting that students learn more when information is seen than heard (e.g., Treichler, 1967) were confirmed. Also, earlier findings suggesting that visuals have utility as a trigger for recall of prior knowledge that can be used to help in cognition were confirmed (e.g., Fleming & Levie, 1979).

There also were significant differences among the groups in the degree of affective response. These significant difference extended to both the presentation itself and to the topic of the presentation. The evidence here too seems clear that affective response can be influenced by the design decisions which determine the formula for combining heard elements and viewed elements of instruction.

There are linkages between affect and cognition, but the nature of these relationships was not isolated by this study. Some linkages were demonstrated to be hit or miss. Among other things, affective stimuli were not shown to reliably stimulate cognitive recall.

Conclusions

The statistically significant findings together with the naturalistic data have been incorporated into the following summary set of conclusions. Although these results are presented in a generalized form and are drawn from data analysis, there is not enough evidence in this single study to claim generalizability to other environments.

1. In a slide + tape (sight + sound) presentation, when verbal language is used to appeal to only one sense via either printed or spoken words, cognitive achievement is not significantly diminished.

2. Pictures used in a slide + tape (sight + sound) presentation prompt viewer recall from memory or experience of information not in the presentation.

3. Cognitive stimuli prompt immediate cognitive recall.

4. Visuals, especially photographs, prompt immediate positive affective responses to a presentation.

5. Music from a slide + tape (sight + sound) presentation, more so than visuals, prompt long range, or delayed, positive affective responses.

6. Students are aware of "when" and "if" they are learning. Changing the delivery-of-instruction mode does not change this apparently innate sense of learning.

7. A desired change in attitude is prompted through the introduction of new concepts and ideas, not through the presentation itself.

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